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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/892,225	06/25/2001	Shunpei Yamazaki	07977/279001/US5023/5025	1969

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EXAMINER	
SONG, MATTHEW J	

ART UNIT	PAPER NUMBER
1765	

DATE MAILED: 05/20/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/892,225	YAMAZAKI ET AL.	
	Examiner	Art Unit	
	Matthew J Song	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-34* is/are pending in the application.

4a) Of the above claim(s) *1-4,8-14,20-22,24-28 and 32-34* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *5-7,15-19,23 and 29-31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *1/23/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 1/23/2004 has been entered.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 1, 6, 15 and 16 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 1 recites, " a concentration of germanium is within a range of 0.1 atom% to 10 atom%" in lines 4-5. The instant specification teaches germanium in the range of 0.1 atomic% to **less than** 10 atomic%, note page 7, line 16. There is no support for the range to include 10 atom%. Likewise for claims 6, 15 and 16.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 5-7 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimizu (US 5,753,541) in view of Noguchi et al (JP 04-168769), where an English Abstract has been provided.

Shimizu discloses a method of fabricating a polycrystalline silicon-germanium thin film transistor (TFT), note entire reference, on an insulating substrate, comprising forming an amorphous silicon layer, an amorphous germanium layer and converting the amorphous silicon layer and the amorphous germanium layer into polycrystalline layers (col 3, ln 1-25). Shimizu also discloses the amorphous silicon and germanium layers are formed by plasma CVD (col 3, ln 26-40 and Example 2). Shimizu also discloses both of the amorphous layers are converted into

polycrystalline layer by annealing using an ultraviolet laser light, such as an excimer laser (col 3, ln 41-67 and Example 3). Shimzu also discloses a source electrode **2** and a drain electrode **3** and an amorphous silicon film used as an ohmic contact layer **4**, this reads on applicant's insulating film covering an electrode, and thereafter forming an amorphous silicon and amorphous germanium layer, which are crystallized by laser light (col 5, ln 1-67). Shimzu also teaches the appl;ication of heat or light to promote recrystallization of amorphous germanium will result in progress of recrystallization of the amorphous silicon layer at a lower temperature than that by conventional methods (col 3, ln 64 to col 4, ln 20).

Shimizu discloses forming a second layer comprising germanium. Shimizu does not disclose the first layer comprises germanium. Selection of any order of performing process steps is prima facie obvious in the absence of new or unexpected results (MPEP 2144.04). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Shimizu by depositing the germanium layer first and the silicon layer second because order of performing process steps is held to be obvious.

Shimizu teaches using a layer of germanium to lower the recrystallization temperature of an amorphous silicon layer (col 3, ln 64 to col 4, ln 20). Shimizu does not teach the first layer of germanium comprises silicon and germanium.

In a method of solid growth, Noguchi et al teaches an amorphous layer **2** made of SiGe or Ge is formed on a substrate **1** and an amorphous silicon layer **3** is formed on the layer **2**. Noguchi et al also teaches the solid growth temperature is lowered because of the sequentially laminated starting material (Abstract). The use of SiGe or Ge is a teaching of known equivalents for reduce the solid growth temperature. It would have been obvious to a person of ordinary skill in the art

at the time of the invention to modify Shimizu by using an amorphous SiGe layer instead of an amorphous Ge layer, as taught by Noguchi et al, because the substitution of known equivalents is held to be obvious (MPEP 2144.06).

The combination of Shimizu and Noguchi et al teach all of the limitations of claim 5, as discussed previously, except the concentration of germanium is within a range of 0.1 atoms% to 10 atom%. Concentration is well known in the art to be a result effective variable and Noguchi et al teaches the concentration of Germanium is a result effective variable, as evidenced in Figure 2. A lower germanium concentration would be desirable to limit the amount of impurities, which can diffuse through the device during high temperature processes. Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Shimizu and Noguchi et al by optimizing the concentration of germanium to obtain the claimed ranged by conducting routine experimentation of a result effective variable. Furthermore, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. (In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235(CCPA 1955)).

6. Claims 15-17 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimizu (US 5,753,541) in view of Noguchi et al (JP 04-168769), where an English Abstract has been provided, as applied to claims 5-7 and 23, and further in view of Teramoto et al (US 5,923,966).

The combination of Shimizu and Nohuchi et al teaches all of the limitations of claim 15, as discussed previously in claim 5, except introducing an element capable of promoting

crystallization of silicon into the first amorphous semiconductor film or the second amorphous semiconductor film.

In a laser processing method, note entire reference, Teramoto et al teaches an amorphous Si film **603** formed by plasma CVD on a glass substrate **601**, introducing nickel for promoting crystallization into the surface of the amorphous silicon film, heat treating the amorphous Si film **603**, thereby providing a crystalline Si film **607** and irradiating the crystalline silicon film **607** is irradiated with last light to further promote the crystallization of the crystalline silicon film **607** (Embodiment 2). Teramoto et al also teaches a KrF excimer laser, a XeCl excimer laser, other excimer lasers, or other means emitting coherent light can be used as a laser (col 33, ln 30-45). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Shimizu and Noguchi et al with Teramoto et al to promote the crystallization of an amorphous film.

7. Claims 19 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimizu (US 5,753,541) in view of Noguchi et al (JP 04-168769), where an English Abstract has been provided, and Teramoto et al (US 5,923,966) as applied to claims 15-16 above, and further in view of Zhang et al (US 5,578,520).

The combination of Shimizu, Noguchi and Teramoto et al teaches all of the limitations of claim 19, as discussed previously in claim 15. The combination of Shimizu and Teramoto is silent to a CVD apparatus with a turbo molecular pump used in an exhaust means connected to a reaction chamber.

In a plasma CVD apparatus for depositing amorphous silicon, Zhang et al teaches a CVD apparatus **2**, where a vacuum evacuation apparatus comprising a turbo molecular pump and a rotary pump connected in series, so that impurity concentration inside the chamber may be maintained as low as possible (Fig 2 and col 6, ln 1-67). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Shimizu, Noguchi and Teramoto with Zhang et al to maintain the impurity concentration in the chamber as low as possible.

Also, Applicant is reminded apparatus limitations, unless they affect the process in a manipulative sense, may have little weight in process claims (In re Tarczy-Hornoch 158 USPQ 141).

8. Claims 18 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimizu (US 5,753,541) in view of Noguchi et al (JP 04-168769), where an English Abstract has been provided, and Teramoto et al (US 5,923,966) as applied to claims 15-16 above, and further in view of Maekawa (US 6,066,547).

The combination of Shimizu, Noguchi et al and Teramoto et al teaches all of the limitations of claim 18, as discussed previously. The combination of Shimizu, Noguchi et al and Teramoto et al is silent to irradiating with a light from one selected from the group consisting of a halogen lamp, a xenon lamp, a mercury lamp, a metal halide lamp as a light source.

In a method of forming a Thin film transistor, note entire reference, Maekawa teaches a transparent substrate of glass or quartz, a step **90** for providing an amorphous film, where silicon, germanium or silicon-germanium alloys are typical amorphous films, for forming a thin film

transistor, a step **92** for depositing a layer of an amorphous film, a step **94** for introducing a transition metal to induce rapid crystallization of the amorphous film and a step **96** for rapid thermal annealing to convert the amorphous film into a polycrystalline film (Fig 20 and col 11, ln 1-67). Maekawa also teaches the rapid thermal annealing step includes annealing with a tungsten-halogen lamp, Xe arc lamp and an excimer laser (col 12, ln 1-50). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Shimizu, Noguchi et al and Teramoto et al with Maekawa because substitution of known equivalents for the same purpose is held to be obvious (MPEP 2144.06).

Double Patenting

9. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

10. Claims 5-7, 15-16, 19 and 31 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 7, 50-51, 59-60, 66 of U.S. Patent No. 6,482,684. Although the conflicting claims are not identical, they are not patentably distinct from each other because the difference between the claims of the instant

application and US 6,482,684 is the instant claims first amorphous layer comprising germanium and a second amorphous semiconductor layer, where US 6,482,684 claims an amorphous semiconductor film and forming a film comprising germanium, which is inherently amorphous because the film is formed on an amorphous film using conventional deposition techniques, i.e. plasma CVD. The first difference between the claims of the instant application and US 6,482,684 is the order the semiconductor thin films are deposited. Selection of any order of performing process steps is prima facie obvious in the absence of new or unexpected results (MPEP 2144.04). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify US 6,482,684 by depositing the germanium layer first and the silicon layer second because order of performing process steps is held to be obvious.

US 6,482,684 also does not claim a silicon and germanium containing film wherein a concentration of germanium is within a range of 0.1 atom% to 10 atom%.

In a method of solid growth, Noguchi et al teaches an amorphous layer **2** made of SiGe or Ge is formed on a substrate **1** and an amorphous silicon layer **3** is formed on the layer **2**. Noguchi et al also teaches the solid growth temperature is lowered because of the sequentially laminated starting material (Abstract). The use of SiGe or Ge is a teaching of known equivalents for reduce the solid growth temperature. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify US 6,482,684 by using an amorphous SiGe layer instead of an amorphous Ge layer, as taught by Noguchi et al, because the substitution of known equivalents is held to be obvious (MPEP 2144.06).

The combination of US 6,482,684 and Noguchi et al teaches all of the limitations of claim 5, as discussed previously, except the concentration of germanium is within a range of 0.1

atoms% to 10 atom%. Concentration is well known in the art to be a result effective variable and Noguchi et al teaches the concentration of Germanium is a result effective variable, as evidenced in Figure 2. A lower germanium concentration would be desirable to limit the amount of impurities, which can diffuse through the device during high temperature processes. Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of US 6,482,684 and Noguchi et al by optimizing the concentration of germanium to obtain the claimed ranged by conducting routine experimentation of a result effective variable.

Referring to claims 19 and 31, Applicant is reminded apparatus limitations, unless they affect the process in a manipulative sense, may have little weight in process claims (In re Tarczy-Hornoch 158 USPQ 141).

Response to Arguments

11. Applicant's arguments with respect to claims 5-7, 15-19, 23 and 29-31 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Canon (JP 59-129859) teaches an amorphous layer **102** composed of Ge or Ge and Si and a second layer of amorphous Si (Abstract).

Hitachi (JP 64-053408) teaches depositing an amorphous germanium layer on a silicon substrate and depositing an amorphous silicon layer thereon and crystallizing the germanium layer (Abstract).

Sanyo (JP 03-284882) teaches laminating amorphous silicon layers **41** and amorphous germanium layers on a substrate and annealing at 300-400°C to crystallize only the germanium layer and not the silicon layer which crystallizes at about 500°C (abstract).

Sexton et al (US 5,225,371) teaches a germanium layer, a polysilicon film and laser annealing to crystallize the layers (col 3-4).

Samechima et al (US 5,726,487) teaches an amorphous silicon layer on a glass substrate, an amorphous SiGe layer on the silicon layer and irradiating with a laser to crystallize the layers (col 3-4).

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 571-272-1468. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Matthew J Song
Examiner
Art Unit 1765

MJS

NADINE G. NORTON
SUPERVISORY PATENT EXAMINER